Activity Title: Southeast Fishery Independent Survey / Tomtate and Triggerfish Lab.

Subject (Focus/Topic): To collect authentic scientific data. To observe and analyze data to determine the distribution and abundance of Tomtate and Triggerfish in a particular habitat.

Grade Level: 6-12.

Average Learning Time: This lab can be accomplished in one class period.

Lesson Summary (Overview/Purpose): In this lab, you will take part in the NOAA Southeast Fishery-Independent Survey (SEFIS). The data you collect and the graphs you make will be compared to SEFIS data to verify the relative abundance of reef fish in the selected locations during the 2013 expedition.

Overall Concept (Big Idea/Essential Question):

Students will be able to determine the relative species abundance for Tomtate and Triggerfish in specific reef habitat in the Southeast Atlantic Ocean.

Specific Concepts (Key Concepts):

1. Students will understand relative abundance of Tomtate and Triggerfish in the Southeast Atlantic Ocean.
2. Students will be able to identify different habitat types in the Southeast Atlantic Ocean.
3. Students will be able to graph all of their data for their selected habitats.
4. Students will be able to create an original lab report to report to SEFIS with their findings.

Focus Questions (Specific Questions):

1. What is a Tomtate and what is their home range?
2. What is a Triggerfish and what is their home range?
3. What are the different types of habitat in the reefs of the Southeast Atlantic Ocean off the coast of the United States?
4. What type of habitat do Triggerfish and Tomtate prefer?

Objectives/Learning Goals:

1. Students will be able to correctly identify Tomtate and Triggerfish with 95% success as a result of completing this lesson.
2. Students will be able to correctly identify different reef habitats of the Southeast Atlantic Ocean with 90% success as a result of completing this lesson.
3. Students will be able to graph their data that they collected from their laboratory with 85% success as a result of completing this lesson.

Background Information: To do this lesson properly students should have a concept of how do identify Tomtate and Triggerfish. This should not be very difficult if they look at the photos that are attached. To go along with this, students should be able to make graphs from the data that is obtained.

Common Misconceptions/Preconceptions: A major misconception that students have is that there are unlimited amounts of fish in the ocean.

Materials: A computer to access the video files from YouTube.

Technical Requirements: While you could use a Google doc to perform this lab you also could just do it by using pencil and paper.

Teacher Preparation: To teach this laboratory it would be good to make sure you have a proper internet connection.

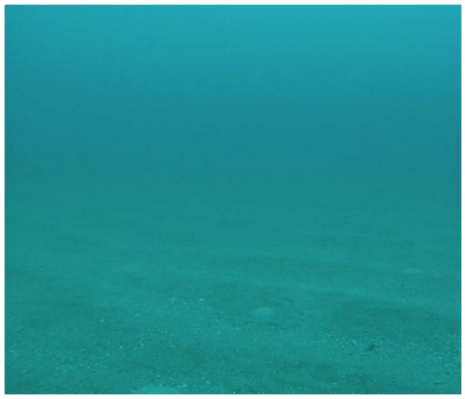
Keywords:

1. Tomtate
2. Triggerfish
3. Chevron Trap
4. Species Diversity
5. Southeast Fisheries Independent Survey (SEFiS)
6. Marine Resources Monitoring Assessment and Prediction (MARMAP)

Pre-assessment Strategy/Anticipatory Set (Optional): State the introduction to the lesson that will be used to get students motivated to take part in the lesson. Explain any pre-assessment activities that will be used to activate students' prior knowledge.

Lesson Procedure:

None



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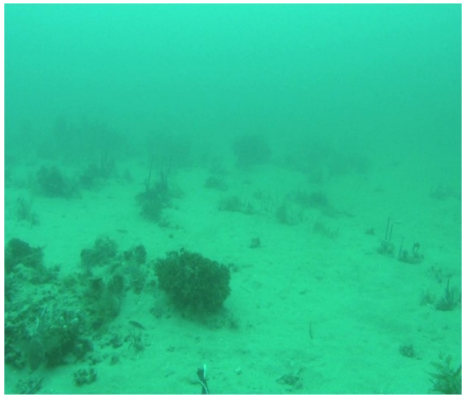

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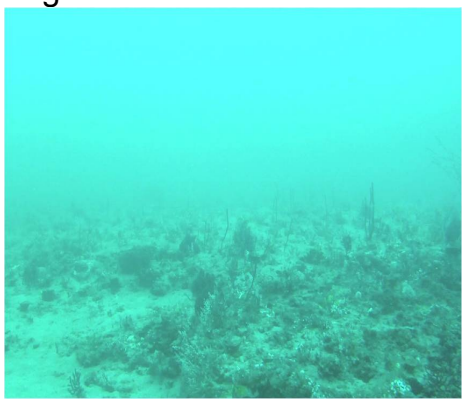


Analyze the Video
Step 1. Obtain the proper video files to work on from your teacher.

Step 2. Pull up the Tomtate / Triggerfish Survey Form and record your first and last name.
https://docs.google.com/a/pontiac.k12.il.us/forms/d/1BUSmV7HUhq92Yf5uKPXjbddHJ4qEOGOZSSMCTv3DrYs/viewform

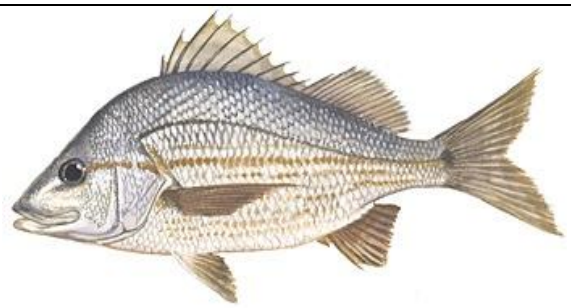
Step 3. Pull up the first file of the trap set. Record the Location Reference Number, which is located on the first file of each particular location. You will see the information on a whiteboard. Each reference number starts with T6013****-* Ex. T60133725-C

FYI-The last 3 digits stand for the number of traps and CTDs released and the letter the camera location. A is the trap entrance and C is the trap nose, and B and D are technically the sides but we very rarely use cameras on these locations.

Step 4. Record the Trap Deployment Date and Time. The trap date is also located on the first set of video file in each particular location. The time you will have to get off of the actual file detail on the hard drive.

Step 5. Load the second file of a particular trap location is assigned to you and start at the one minute mark. Stop the video and count all of the Tomtate and/or Triggerfish in the scene. You might have to roll the image back and forward several seconds to make sure you are counting all of the fish in the X:00 mark.
Image 1, Image 2, Image 3, etc.

Step 6. Record the type of fish and number of each in the “Type of Fish” and “Number of Fish Visible” fields. If your teacher assigns you both Tomtate and Triggerfish you need to do a second, separate record for each type.



Tomtate

Haemulon aurolineatum

One of the smallest of the grunts, the tomtate are not highly regarded by fishermen, however it is an important food for larger fish-eating reef fishes. Often seen by divers, tomtates are approachable and serve as a warning when larger fish are near by tightening their schools and moving away from the predator. The tomtate is silver white all over with a yellow-brown stripe running the length of the body and ending as a black blotch at the base of the caudal fin. This spot is also evident in most juvenile grunts, and may be lost by older fish. The inside of its mouth is bright red.

Gray Triggerfish

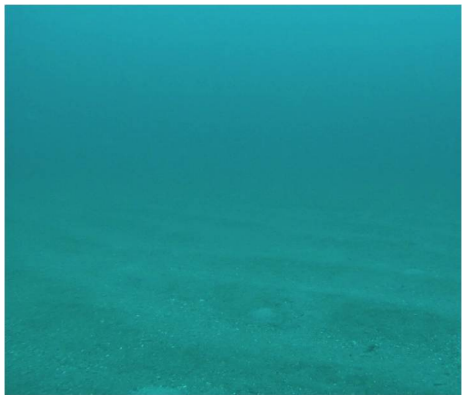
Balistes capriscus

The Gray Triggerfish has large incisor teeth and a deep laterally compressed body covered with tough, sandpaper-like skin. Unlike their cousin, the filefish, triggerfish have more than one dorsal spine. The action of this spine gives the triggerfish its (common) name. The first spine is large, and when erect it remains so until the smaller second spine is deflexed, triggering the first. the gray triggerfish is easily distinguished by its drab color from the queen triggerfish, which is vividly colored.

Step 7. Record the Percent Reef Fish Habitat / Cover by choosing None, Low, Medium, High. All sand = None
Mostly Rock = High

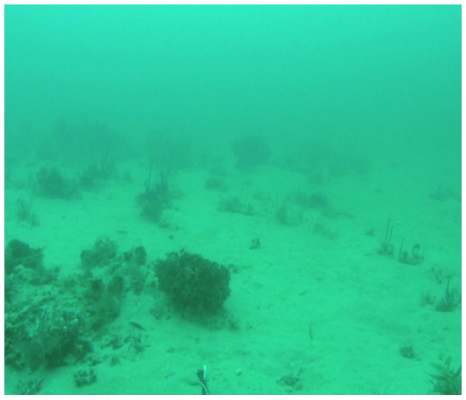
Each entry for the same video will have all of the same habitat type because the trap is sitting in the same location.

None

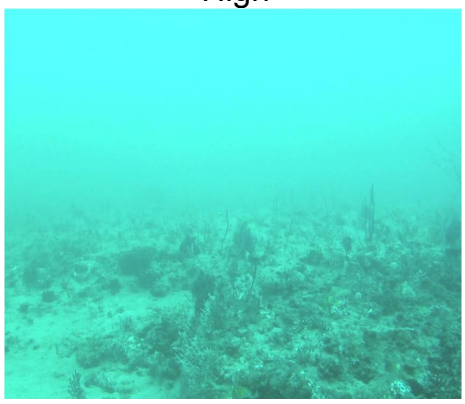


Low

Medium



High



Step 8. Hit submit.

Step 9. Fast forward the file to the two minute mark and repeat steps 2-8.

Step 10. Repeat until you reach twenty minutes or the end of the file whichever comes first.

Step
Making Sense of the Data

Step 11: Once you have finished entering your data for the entire 20 minute read time, use the data you have gathered to create a graph of your fish species over time on the tape. Use time as your independent variable and number of fish as your dependent variable. Remember to include all appropriate labels on this graph as well as an understandable legend.

Step 12: Once your partner has finished entering the data for the other species on the same deployment, plot the data for both species over time on the same graph. Use time as your independent variable and numbers of fish as your dependent variable. Remember to include all appropriate labels on this graph as well as an understandable legend.

Step 13: Find the average number of triggerfish on your tape. Remember: to calculate an average, you would add up all of the numbers you had at each minute and divide by the number of minutes you sampled (include zeros).

Step 14: Using the same method, find the average number of tomtates on your tape.

Step 15: Using all of the data collected by your class, create a table which shows the average number of triggerfish and the average number of tomtates observed on each tape. Then, calculate an average number of triggerfish and tomtates observed on all tapes combined. You should do this by taking all of the numbers of triggerfish combined & dividing by the total number of samples. Use the same procedure for average number of tomtates.

Step 16: Now, divide the data into four sets by relief type. Calculate the average number of triggerfish and the average number of tomtates for each habitat type.

Step 17: Create a bar graph showing the average number of triggerfish and the average number of tomtates for each habitat type. Use number of fish as your dependent variable and habitat type as your independent variable.

Assessment and Evaluation:

Writing the Lab Report:
Create an original lab report to report to SEFIS what you have found.
This lab report should include the following:

- Introduction. 8 points
  Include:
  - background about the study
  - why this information is important
  - Short descriptions of each fish species
  - both the common and scientific name for each species

- Methods. Include: 8 points
  Include:
  - A description of reading the video for fish
  - A description of determining habitat type
  - A description of taking an average
  - A description of the two types of graphs you used

- Results & Discussion. 16 points
  Include:
  - The average number of triggerfish for your tape
  - The average number of tomtates for your tape
  - A very brief description of trend over time for each species (Does the number of triggerfish go up or down with time? Does the number of tomtates go up or down with time?)
  - Discuss why you think the trend occurred the way it did in each species
  - The average number of tomtates observed by the class
  - The average number of triggerfish observed by the class
  - A very brief description of the comparison between numbers of each species by habitat type. (Is the number of tomtates highest on no habitat? etc.)
  - Discuss why you think this result was observed.

- Conclusion. Include: 6 points
  - Whether your data shows that the presence of tomtates or triggerfish are impacted by the presence of the baited trap. Are they attracted? Repelled? Indifferent?
  - Whether the class data shows a “preference” for a specific type of habitat by each species. Are tomtates generally found on no rock, low rock, medium rock, or high rock? Which of these are triggerfish generally found on?
  - One further study you think would be interesting to conduct about reef fish in the southeast region.

Standards:

- **Next Generation Science Standard(s) Addressed:**

2-LS4 Biological Evolution: Unity and Diversity

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Students who demonstrate understanding can:

2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats. [Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. ▪ Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1) --- ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** ▪ Scientists look for patterns and order when making observations about the world. (2-LS4-1)	**LS4.D: Biodiversity and Humans** ▪ There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)	

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade-levels: **3.LS4.C** (2-LS4-1); **3.LS4.D** (2-LS4-1); **5.LS2.A** (2-LS4-1)

Common Core State Standards Connections:

ELA/Literacy –

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS4-1)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-LS4-1)

Mathematics –

MP.2 Reason abstractly and quantitatively. *(2-LS4-1)*

MP.4 Model with mathematics. *(2-LS4-1)*

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. *(2-LS4-1)*

Ocean Literacy Principles Addressed:

5. The ocean supports a great

diversity of life and ecosystems.

A. Ocean life ranges in size from the smallest living things, microbes, to the largest animal on Earth, blue whales.

B. Most of the organisms and biomass in the ocean are microbes, which are the basis of all ocean food webs. Microbes are the most important primary producers in the ocean. They have extremely fast growth rates and life cycles, and produce a huge amount of the carbon and oxygen on Earth.

C. Most of the major groups that exist on Earth are found exclusively in the ocean and the diversity of major groups of organisms is much greater in the ocean than on land.

D. Ocean biology provides many unique examples of life cycles, adaptations, and important relationships among organisms (symbiosis, predator-prey dynamics, and energy transfer) that do not occur on land.

E. The ocean provides a vast living space with diverse and unique ecosystems from the surface through the water column and down to, and below, the seafloor. Most of the living space on Earth is in the ocean.

F. Ocean ecosystems are defined by environmental factors and the community of organisms living there. Ocean life is not evenly distributed through time or space due to differences in abiotic factors such as

oxygen, salinity, temperature, pH, light, nutrients, pressure, substrate, and circulation. A few regions of the ocean support the most abundant life on Earth, while most of the ocean does not support much life.

G. There are deep ocean ecosystems that are independent of energy from sunlight and photosynthetic organisms. Hydrothermal vents, submarine hot springs, and methane cold seeps, rely only on chemical energy and chemosynthetic organisms to support life.

H. Tides, waves, predation, substrate, and/or other factors cause vertical zonation patterns along the coast; density, pressure, and light levels cause vertical zonation patterns in the open ocean. Zonation patterns influence organisms' distribution and diversity.

I. Estuaries provide important and productive nursery areas for many marine and aquatic species.

http://www.coexploration.org/oceanliteracy/documents/OceanLitChart.pdf

Additional Resources:

Kristy Weaver. 2012 NOAA Teacher at Sea aboard RV Savannah

1st graders narrating trap/camera deployment

http://teacheratsea.wordpress.com/2012/09/07/kristy-weaver-trapped-video/

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Creation date: July 28, 2013